

Impact of Covid-19 on the Income and Employment of Various Income Groups: A Case Study of Punjab

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Since the present pandemic Covid-19 issue and the economic slowdown brought on by sanitary measures, the number of workers who missed work or worked fewer hours surged at an unprecedented rate, and the number of jobs lost increased as well. The present research examined the impact of covid-19 on income and employment in Punjab using cross-sectional data collected from the HIES household 208 observations from Punjab Pakistan. Data were collected only during the period of lockdown analysis is not enough to generalize. Ordinary least squares (OLS) and Generalized Poisson regression models were employed for the empirical analysis of the data. The research revealed that region, age, the average number of reduced working hours, avoidance the going to the mosque/ religious gathering, agricultural land, Loans from employees, avoiding public transport, and long-distance travel avoidance show a strongly significant relationship with average monthly income Covid-19. The results of the Generalized Poisson regression model showed that variable gender, Agriculture land, Owned house, and avoiding social gatherings of more than 4 people have a positive impact and are signed with the average number of reduced working hours. There was a positive significant association between depression and food insecurity. He could not find a significant impact of covid-19 on income. Moreover, the variable expense has a negative but insignificant impact on income. Covid-19 has impacted the effect on income and employment of the people.

Keywords: COVID-19; Employment; Generalized Poisson regression; Income; Ordinary Least square; Punjab.

INTRODUCTION

The COVID-19 virus the first time it was discovered in Wuhan, China, in December 2019. The World Health Organization classified the illness as a global pandemic on March 11, 2020. Since the virus's debut, there have been more than 15.2 million confirmed cases worldwide, with more than 623 000 fatalities as of 23 July 2020. The majority of COVID-19 cases that were exported worldwide in the early phases of the outbreak had a history of prior travel to Wuhan. Despite being geographically close to China and Iran, Pakistan reported its first two COVID-19 instances on February 26, 2020. In order to stop the virus' spread, Pakistani provincial governments imposed partial, then lockdowns in each of their administrative regions. In contrast, these actions were phased in, with educational institutions all around the nation closing on March 13, 2020, in reaction to the pandemic. Pakistan had around 260 000 confirmed cases of COVID-19 as of July 23, 2020, and there have been roughly 5700 fatalities. After one year, Pakistan has seen four waves of the pandemic, resulting

in 1.2 million illnesses and 26,000 fatalities (Fairlie *et al.*, 2020; Montenegro *et al.*, 2020; Rabbani *et al.*, 2022).

By analyzing the effects of Covid-19-induced NHRD policies on rural and urban employment, we contribute to the field of individual employees during the crisis. Different financial catastrophes, economic recessions, and pandemics like the graduate unemployment rate have increased globally because of COVID-19 and the Spanish flu. 1 in 5 workers lost their jobs as the global unemployment rate increased to 10% between 2007 and 2009 due to the financial crisis. Due to the economic recession, thousands of graduates lost their jobs in both domestic and international labor markets at that time, and Bangladesh's graduate unemployment rate rose from 13% to 17% between the years 2006 to 2009; Angelucci *et al.*, 2020; Haq *et al.*, 2021). Bangladesh was impacted by the currency depreciation, economic slowdown, and decrease in foreign direct investment (FDI) and remittances to the nation during the 1998 Asian financial crisis. As a result, Bangladesh saw thousands of job losses (Zayed *et al.*, 2021; Paul *et al.*, 2021; Garrison *et al.*, 2022). Because COVID-19 had both direct and indirect consequences on a person's life, it caused

considerable distress throughout the world. Any pandemic, regardless of its severity, has a negative impact on the healthcare industry because it increases the demand for healthcare workers and resources, which already strains healthcare facilities. Economic activity is typically hampered by restrictions on movement and engagement as well as the use of physical distance and lockdowns (Shafi *et al.*, 2020; Hossain, 2021; Mandel and Veetil, 2020).

There are only a few studies that examined the impact of COVID-19 on income and employment in Punjab. According to the best of my knowledge, there are few studies available in which the impact of COVID-19 on income is penalized. However, there is no study found in which the impact of COVID-19 unemployment was analyzed. Cross-sectional data were used for the whole province of Punjab Pakistan. Data was collected in Punjab Pakistan. Data was collecting 208 observations from Pakistan. There is no study in which the impact of covid-19 employment was analyzed using cross-sectional data in Punjab. The current study fulfills this research gap. The present research examined the impact of covid-19 on income and employment in Punjab using cross-sectional data collected from the HIES household 208 observations from Punjab Pakistan. Data were collected only during the period of lockdown; analysis is not enough to generalize (Fletcher *et al.*, 2022). He could not find a significant impact of COVID-19 on income. For the empirical estimation of the research objective, the Poisson regression model and the Ordinary least square technique are used in the present study. The result of the study will help the policy decision-making for the welfare of the household in the COVID-19.

MATERIALS AND METHODS

Data: This study can be done in whole the province of Punjab as well as other provinces of Pakistan for better evaluation of covid-19 on income and employment. But due to a shortage of time and resources, only Punjab is chosen for the present study. This study was based on cross-sectional data. A representative sample of 208 was collected from Punjab. Household survey data was collected from cross-section data was used that obtained from the household income and expenditure survey HIES up to 208 observations from Punjab Pakistan. It was taken from a secondary source, and after extracting unknown values from it, the remaining observations were 208.

Model Specification: To achieve the objectives of the study, two different models are used for the estimation of the empirical results of the study. The first model consists of the following variables such as region, gender, age, the average number of reduced working hours, average monthly income during covid-19, avoiding going to the mosque/ religious gatherings, agricultural land, Loans from employees, avoidance of public transport and long-distance travel

avoidance. To achieve the empirical results of the first model we will use the ordinary least square model. The general Form of Model 1 is written as;

$$\text{Model 1: } \text{AMINC} = \beta_0 + \beta_1 \text{XREG} + \beta_2 \text{XGEN} + \beta_3 \text{XAGE} + \beta_4 \text{XRWH} + \beta_5 \text{XAGM} + \beta_6 \text{XAGL} + \beta_7 \text{XLFE} + \beta_8 \text{XAPT} + \beta_9 \text{XLDTA} + \epsilon \quad (1)$$

Here IMINC is Average Monthly Income during Covid-19 that is dependent variable. However, REG=Region, GEN=Gender, AGE=Age, ANRWH=Average number of reduced working hours, AGM=Avoid going to the mosque/religious gatherings, ACL=Agriculture land, LFE=Loan from employer, APT=Avoiding public transport, and LDTA=Long distance travel avoidance are used as explanatory variables in this study. Moreover, ϵ is the error term.

$$\text{Model 2: } \text{ANRWH} = \beta_0 + \beta_1 \text{LFS} + \beta_2 \text{AGM} + \beta_3 \text{AGL} + \beta_4 \text{ASG} + \beta_5 \text{OH} + \beta_6 \text{AMINC} + \epsilon \quad (2)$$

In the eq. 2, the dependent variable is ANRWH=Average number of reduced working hours, whereas GEN= Gender, LFS= Loan from formal sources, AGM= Avoid going to market AGL= Agriculture land, ASG= Avoiding social gatherings of more than 4 people, OH= Owned House, and AMINC= Average monthly earning during covid-19

Econometric Strategy: To obtain the empirical results of the above-mentioned models, two econometric methods including OLS and Generalized Poisson regression method are used in this study. In this study, OLS is used to analyze the model 1. OLS is a linear regression analysis used to calculate the unknown estimates of a linear model for the purpose of minimizing the sum of the square of residuals. Carl Friedrich Gauss was the man who for the first time presented the OLS method in 1795 and Adrien-Marie Legendre published this in 1805. It can be estimated by the difference comparing the observed values and the dependent variable, respectively, and the independent. Furthermore, the ordinary least square is very famous for its valid characteristics and durability in its range and is used in the case of continuous dependent variables.

Furthermore, the study employs the model of Poisson regression to estimate regression parameters. For Poisson regression, dependent variables are necessary for multiple regression and linear regression to be based on a scale that is "continuous", while logarithmic binomial regression, ordinal regression, multinomial logistic regression, and logistic regression require dependent variables to be measured on "dichotomous," "ordinal," and "nominal" scales, respectively. Contrarily, data in an integer must be zero or more for count variables. Consider an "integer" as a "whole" number to put it simply. Data from the dependent variable are counted. The data used in other well-known types of regression are different from count data. Dependent variables are necessary for multiple regression and linear regression to be based on a scale that is "continuous" scale, while logarithmic binomial regression, ordinal regression, multinomial logistic regression, and logistic regression require dependent



variables to be measured on "dichotomous," "ordinal," and "nominal" scales, respectively. Contrarily, data is an integer that must be zero or more for count variables. Consider an "integer" as a "whole" number to put it simply. This is a crucial presumption. Inadequate independent observations are typically a problem with a study design. Checking for significant variations between robust errors and standard model-based errors is one way to examine whether or not observations might be independent of one another. Our research also identifies important factors that predicted the outcome variable are Gender, Loans from formal sources, Avoiding going to market, Agriculture land, Avoiding social gatherings of more than 4 individuals, Owning a house, and monthly average income during covid-19.

Empirical results

Descriptive analysis: Table 1 shows the descriptive results of socio-economics characteristics of cross-sectional data. A representative sample of 208 was collected from Punjab. In the Table 1, different variables are represented as region, gender, marital status, maximum education attained, employment status, working hours, spent saving and investment, loans from employer, loans from formal sources, livelihood opportunity, agricultural land, and own house. The Table is also showing the N statistics, range statistics, minimum, maximum, mean, standard deviation, and variance of all these variables. The minimum region of respondents is 1.0 and the maximum region of respondents is 2.0. The mean values of the region are 1.702 out of 208 samples and the standard deviation is showing the value of the region is .4585. The variance values of the region are .210. The minimum marital status of respondents is 1.0 and the maximum marital status of respondents is 4.0. The mean values of marital status are 1.486 and the standard deviation is showing the value of the marital status as .6058. The variance values of marital status are 0.367.

The mean values of employment status are 4.062 and the standard deviation is showing the value of employment status at 2.5292. The variance values of employment status are

6.397. The minimum employment status of respondents is 1.0 and the maximum employment status of respondents is 7.0. The standard deviation and mean values of the average number of reduced working hours are 4.452, 1.3179. The variance values of the average number of reduced working hours are 1.737. The minimum average number of reduced working hours of respondents is 2.0 and the maximum average number of reduced working hours of respondents is 10.0.

The minimum loan from the employer of respondents is 1 and the maximum loan from the employer of respondents is 3. The mean values of loans from employers are 1.91 and the standard deviation is showing the value of loans from employers at .321. The variance values of loans from employers are .103. The minimum agricultural land of respondents is 1.0 and the maximum agricultural land of respondents is 2.0. The mean values of agricultural land are 1.928 and the standard deviation is showing the value of agricultural land at .2593. The variance values of agricultural land are .067.

Empirical Analysis: As, OLS and Generalized Poisson regression methods are used for the empirical analysis in this study. The results of model 1 are obtained through OLS, which are showed in Table 2. However, the outcomes of Generalized Poisson regression for model 2 are explained in Table 3.

Results of OLS: The results of OLS shows that the coefficient value of the constant is 3.431 which is representing an average value regarding the dependent variable which is the average monthly income covid-19; when all the independent variables are considered to be zero. The first row of the Table 2 is representing the coefficient value, std. error, and t. statistics, and the p-value of the dependent variables. The value standard error is .302. The value of t statistics is 11.378 and the significant level of 1% with a value of .000 which shows that the dependent variable that is average monthly income is highly important at a 1% degree of significance. The coefficient worth of the region is .636 which is extremely important at a 1 percent level of significance which shows that

Table 1. Descriptive analysis

Variable	N	Range	Min.	Max.	Mean		Std. dev	Variance
Gender	208	1	1	2	1.433	0.0344	0.4966	0.247
Marital status	208	3	1	4	1.486	0.0420	0.6058	0.367
Maximum education attained	208	13	1	14	4.846	0.2289	3.3006	10.894
Employment status	208	6	1	7	4.062	0.1754	2.5292	6.397
The average number of reduced working hours	208	8	2	10	4.452	0.0914	1.3179	1.737
Spent savings and investment	208	2	1	3	1.310	0.0330	0.4830	0.233
Loans from employer	208	2	1	3	1.910	0.0220	0.3210	0.103
loans from formal sources	208	2	1	3	1.960	0.0170	0.2470	0.061
Livelihood opportunity	208	2	1	3	1.950	0.0180	0.2560	0.065
Agriculture land	208	1	1	2	1.928	0.0180	0.2593	0.067
Owning house	208	1	1	2	1.476	0.0347	0.5006	0.251
Valid N	208							



the region has a positive relationship with the average monthly cost. The coefficient value of the region shows that the one category change in the region leads to an increase in average monthly income by Rs.636

The coefficient value of age is .325 which is also positive with a standard error of .168 and a t. statistics value of 1.941. The value of the coefficient shows that one unit change in age leads to Rs .325 in the average monthly salary in covid-19. The p-value of coefficient age is also highly significant with .054 at a 5% level of significance thus the hypothesis testing shows that we reject the null hypothesis and accept the alternative hypothesis; indicating that both variables have a strong positive association with each other while remaining other variables constant. Another coefficient value of the average number of reduced working hours -.418 is also negative shows that 1 category in the average number of reduced working hours from good to poor category leads to an increase in the average monthly income by Rs -.418. It is also significant with the p-value of .016 at a 5% level of significance indicating that both variables have a strong negative association with each other while remaining other variables constant. The value of standard error and t. statistics is .172 and -2.429 respectively.

Table 2. Result of OLS

Model	Unstandardized coefficients		Standardized coefficients	T	Sig.
	B	Std. error	Beta		
Constant	3.431	0.302		11.378	0.000
REG	0.636	0.176	0.234	3.615	0.000
GEN	0.143	0.157	0.057	0.910	0.364
AGE	0.325	0.168	0.124	1.941	0.054
ANRWH	-0.418	0.172	-0.155	-2.429	0.016
AGM	-0.528	0.293	-0.140	-1.805	0.073
AGL	1.096	0.306	0.228	3.583	0.000
LFE	-1.070	0.324	-0.210	-3.305	0.001
APT	-0.590	0.267	-0.169	-2.208	0.028
LDTA	0.917	0.317	0.222	2.891	0.004

R²=0.247; Adjusted R²=.212; F=7.203; F (Prob.)=0.000

The coefficient value of avoiding going to the mosque/religious gathering is .528 which is also negative with a standard error of .938 and a t-statistics value of -1.805. The value of the coefficient shows that one unit change in avoiding going to the mosque/religious gathering leads to Rs -.528 in the average monthly salary in covid-19. The p-value of the coefficient avoiding going to the mosque/religious gathering is also highly significant with .073 at a 7% level of significance thus the hypothesis testing shows that we reject the null hypothesis and accept the alternative hypothesis; indicating that both variables have a strong negative association with each other while remaining other variables constant. Another coefficient value of the agriculture land 1.096 is also positive shows that 1 category in the agriculture land from good to poor category leads to an increase in the

average monthly income by Rs 1.096. It is also significant with a p-value of .000 at a 1% level of significance indicating that both variables have a strong positive association with each other while remaining other variables constant. The value of standard error and t. statistics is .306 and 3.583 respectively.

The coefficient value of a loan from an employer is -1.070 which is also negative with a standard error of .324 and a t-statistics value of -3.305. The coefficient value shows that a 1 unit change in loan from an employer leads to Rs -1.070 in the average monthly salary in covid-19. The p-value of the coefficient loan from the employer is also highly significant with .001 at 1% as a significant level thus the hypothesis testing shows that we reject the null hypothesis and accept the alternative hypothesis; indicating that both variables have a strong negative association with each other while remaining other variables constant. Further, the coefficient value of avoiding public transport -.590 is also negative shows that 1 category in the avoiding public transport from good to poor category leads to an increase in the average monthly income by Rs -.590. It is also significant with a p-value of .028 at a 3% level of significance indicating that both variables have a strong negative association with each other while remaining other variables constant. The value of standard error and t. statistics is .267 and -2.208 respectively.

In addition, the coefficient value of long-distance travel avoidance is .917 which is also positive with a standard error of .317 and a t-statistics value of 2.891. The coefficient value shows that a 1 unit change in loan from an employer leads to Rs .917 in the average monthly salary in covid-19. The p-value of the coefficient for long-distance travel avoidance is also highly significant with .004 at 1% as a significant level thus the hypothesis testing shows that we reject the null hypothesis and accept the alternative hypothesis; indicating that both variables have a strong negative association with each other while remaining other variables constant. Now we will see in the last row of Table 2. The F statistics value is 7.203, which is highly significant at a 1% level with the value of .000. Because tells us about the overall model, the highly significant F statistics value demonstrates that the overall model is the best predictor of response. The value of R square is .25 showing the coefficient of determination that is valid and strong. The value of adjuster R square is showing that 21% of variations in the dependent variable are explained by these independent variables. In fact, these values show that the overall model is a standardized and good fit.

3.2.2 Results of Generalized Poisson regression:

Additionally, Table 3 presents the results of Poisson regression for the average number of reduced working hours. The entire model has a significantly better fit than the partial model, according to the likelihood ratio chi-square test. The coefficient value represents that the variable gender has a positive but significant influence on the average number of reduced working hours. Gender was a significant predictor of



Table 3. Results of Poisson regression.

Parameter	B	Std. Error	95% Wald confidence interval		Hypothesis test		
			Lower	Upper	Wald Chi-square	df	Sig.
Intercept	1.916	0.3583	1.214	2.619	28.61	1	.000
Gender	-0.127	0.0723	-0.269	0.015	3.069	1	.080
A loan from a formal source	-0.199	0.3230	-0.832	0.434	0.380	1	.537
Avoid going to market	0.111	0.1071	-0.098	0.321	1.083	1	.298
Agricultural land	-0.238	0.1370	-0.507	0.030	3.027	1	.082
Avoiding social gathering	-0.270	0.1189	-0.503	-0.037	5.174	1	.023
Owned house	0.112	0.0665	-0.019	0.242	2.820	1	.093
Average monthly income during covid-19	2.125E-6	2.104E-6	-6.248E-6	1.998E-6	1.020	1	.313

the number of advanced placement courses taken ($B = -.127$, $S.E=.0723$). For every one-unit increase in gender, the predicted log count of courses taken increased by $-.127$. The coefficient value of gender is $-.127$ which is also positive with a standard error of $.0723$ and confidence interval is $.015$ and a significant level of 8% with a value of $.08$.

Moreover, the coefficient value of agricultural land is $-.238$ which is also positive with a standard error of $.1370$ and confidence interval is $.030$ and a significant level of 8% with a value of $.08$. The coefficient value of avoiding social gathering is $-.270$ which is also positive with a standard error of $.1189$ and the negative confidence interval is $-.037$ and a significant level of 2% with a value of $.023$. Finally, the coefficient value of owned house is $.112$ which is also positive with a standard error of $.0665$ and confidence interval is $.242$ and a significant level of 9% with a value of $.093$.

Conclusion: The main objective of this study was to examine the impact of Covid-19 on the income and employment of various income groups from Punjab, Pakistan. This study was based on cross-sectional data. A representative sample of 208 was collected from Punjab. Ordinary least squares (OLS) and Generalized Poisson regression models were used for the empirical analysis of the data. The research revealed that the region, age, average number of reduced working hours, avoiding going to the mosque/ religious gathering, agricultural land, loans from employees, avoiding public transport, long-distance travel avoidance get treatment are all variables that have a strong significant relationship with average monthly income Covid-19. The results of the Generalized Poisson regression model show that variable gender, Agriculture land, Owned house, and avoiding social gatherings of more than 4 people have a positive impact and are signed with the average number of reduced working hours.

Based on the study' findings, it is suggested that the Punjab government should create certain laws that guarantee employment subsidies, implement programs for skill development, increase employment market adaptability, start credit-based job-creation initiatives, and foster Punjab

entrepreneurship ecosystems. To reduce food inflation and guarantee that households may buy food at their chosen markets, the food supply chain should be safeguarded. The greatest way to address the rising unemployment issue is considered to be through small-scale industry, which comprises the village and cottage industries. The study should be conducted in a wide range to generalize the results.

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Availability of data and material: We declare that the submitted manuscript is our work, which has not been published before and is not currently being considered for publication elsewhere?

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